# MANUFACTURING OF PARTICLEBOARD FROM PAPER MULBERRY (*BROSONATIA PAPYRIFERA*) WOOD

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## Abstract

Particleboards with densities of 0.60–0.70 g/cm$^3$ were manufactured from Paper mulberry (*Brosonatia papyrifera*) wood having specific gravity of 0.50. Boards were bonded with urea-formaldehyde resin glue. Mechanical properties (MOE, MOR, IB strength and screw-withdrawal resistance) and dimensional stabilities (Thickness swelling, water absorption and Linear expansion) of the boards were determined. Mechanical properties of boards of paper mulberry increased with board density. The boards with density 0.66 g/cm$^3$ have better dimensional stability than those with the density lesser or greater than this value.

## Introduction

*Brosonatia papyrifera* is a medium deciduous tree, 3 to 12m in height. It is a native tree of Japan, South East Asia and China. In Pakistan it is successfully planted and established in the plains and hills. It has become a weed in Islamabad and measures are being taken to eradicate it as it is an allergen causing cold, sneezing and cough. It is a low density wood with high growth rate. The sapwood is grayish white and the heartwood is light brown in colour. The wood is straight grained and coarse textured (Sheikh, 1993).

Different grades of particleboards have woody raw material choice basing upon their density and specific gravity. Technically, low wood density is the deciding factor to utilize the wood species for this purpose. Since the low density wood species can be compressed into medium density particleboard for achieving enough bonding strength due to the maximum inter-particle contact during pressing. Particleboard is a wood substitute provided it offers properties good enough to cater the varying end uses (Carre, 1974). Wood density is considered the most important species variable that affects the particleboard properties. In general the board properties are inversely related to the density of wood species. Lower density woods will give panels of desired specific gravity and superior strength properties than that of higher density wood species (Vital, 1975).

In this study paper mulberry wood was selected because of its lower density and availability to find out its suitability for the manufacture of resin bonded

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particleboard, standardize manufacturing parameters as well as to determine the optimum board density possible to be achieved.

## Materials and Methods

### Procurement of raw material

A ten year old tree of paper mulberry was harvested on the campus of Pakistan Forest Institute, Peshawar. Only the branches and under size stem pieces with a minimum diameter of 6 centimeters were used as wood raw material.

An aqueous suspension of urea formaldehyde condensate having solid content 60% was used as binding material for manufacturing of the particleboards.

### Wood Particle Preparation

The wood was converted into blocks and soaked in water to achieve moisture content above the fibre saturation point (Fischer, 1972). The wood was converted into 0.30 mm thick particles by using German made "small shredding machine μK–20". The particles generated by the machine were dried to 7-9 percent moisture content and then screened by passing through 1-½ inch mesh wire and then through ½ inch mesh wire. Those retained on the smaller wire mesh were classified as acceptable particles. Fine and oversized particles were discarded.

### Test panels manufacturing

5 replicate panels with target densities 0.60, 0.62, 0.64, 0.66, 0.68 and 0.70-$g/cm^3$ were made from the particles blended with liquid urea formaldehyde resin glue to 8 percent resin solid (based on oven dried wood weight). The blended material was spread into a mat in a wooden framing device manually. The mat was pressed in a hydraulic press at pressing temperature of 140°C. Pressing time was 10 minutes to closing against ½ inch stop.

### Evaluation of Test Panels

Test specimens were made in accordance with the standard procedure (ASTM D1037-78) to evaluate modulus of rupture (MOR), modulus of elasticity (MOE), internal bond (IB), face screw withdrawal (FSW) and edge screw withdrawal (ESW), thickness swelling (TS) and water absorption (WA) after soaking in water and linear expansion (LE) with change in moisture content.

## Results and Discussion

The mechanical and hygroscopic properties for each independent variable